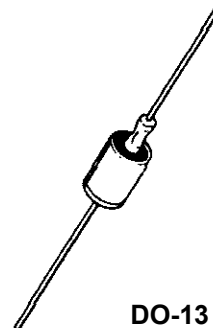


## DESCRIPTION

This well established zener diode series for the 1N3016 thru 1N3051 JEDEC registration in the metal case DO-13 package provides a glass hermetic seal for 6.8 to 200 volts. It is also well suited for high-reliability applications where it is available in JAN, JANTX, and JANTXV military qualifications. Lower voltages are also available in the 1N3821 thru 1N3830 series (3.3 V to 7.5 V) in the same package (see separate data sheet). Microsemi also offers numerous other Zener diode products for a variety of other packages including surface mount.

## APPEARANCE



**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

## FEATURES

- Zener Voltage Range: 6.8V to 200V
- Hermetically sealed DO-13 metal package
- Internally solder-bonded construction.
- Also available in JAN, JANTX, JANTXV qualifications per MIL-PRF19500/115 by adding the JAN, JANTX, or JANTXV prefixes to part numbers for desired level of screening, e.g. JANTX1N3016B, JANTXV1N3051B, etc.
- Surface mount also available with 1N3016BUR-1 thru 1N3051BUR-1 series on separate data sheet

## APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range
- Wide selection from 6.8 to 200 V
- Tight voltage tolerances available
- Low reverse (leakage) currents
- Nonsensitive to ESD
- Hermetically sealed metal package
- Inherently radiation hard as described in Microsemi MicroNote 050

## MAXIMUM RATINGS

- Operating Junction and Storage Temperatures: -65°C to +175°C
- THERMAL RESISTANCE: 50°C/W\* junction to lead at 0.375 inches (10 mm) from body or 110°C/W junction to ambient when leads are mounted on FR4 PC board with 4 mm<sup>2</sup> copper pads (1 oz) and track width 1 mm, length 25 mm
- DC Power Dissipation\*: 1.0 Watt at  $T_L \leq +125^\circ\text{C}$  3/8" (10 mm) from body or 1.0 Watts at  $T_L \leq +65^\circ\text{C}$  when mounted on FR4 PC board as described for thermal resistance above (also see Fig 1)
- Forward Voltage @ 200 mA: 1.5 Volts.
- Solder Temperatures: 260 °C for 10 s (maximum)

## MECHANICAL AND PACKAGING

- CASE: DO-13 (DO-202AA), welded, hermetically sealed metal and glass
- FINISH: All external surfaces are Tin-Lead (Pb/Sn) plated and solderable per MIL-STD-750 method 2026
- POLARITY: Cathode connected case.
- WEIGHT: 1.4 grams.
- Tape & Reel option: Standard per EIA-296 (add "TR" suffix to part number)
- See package dimensions on last page

\* For further mounting reference, thermal resistance from junction to metal case may be reduced to  $\leq 20^\circ\text{C/W}$  when mounting DO-13 metal case directly on heat sink.

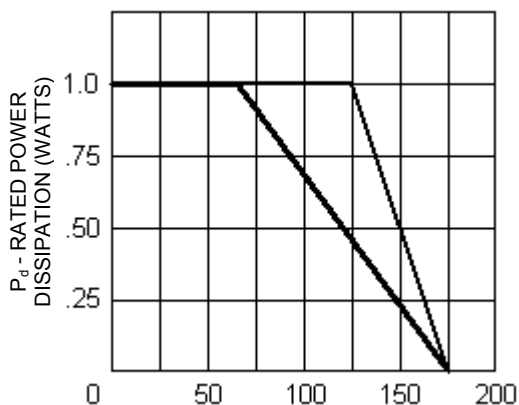
**\* ELECTRICAL CHARACTERISTICS @ 25°C**

| JEDEC<br>TYPE<br>NUMBER<br>(Note 1) | NOMINAL<br>ZENER<br>VOLTAGE<br>V <sub>Z</sub> @ I <sub>ZT</sub><br>(Note 2) | ZENER<br>TEST<br>CURRENT<br>I <sub>ZT</sub> | MAXIMUM ZENER IMPEDANCE<br>(Note 3) |                 |                   | MAXIMUM<br>ZENER<br>CURRENT<br>I <sub>ZM</sub><br>(Note 4) | MAXIMUM<br>REVERSE<br>LEAKAGE<br>CURRENT† |                  | TYPICAL<br>TEMP. COEFF.<br>OF ZENER<br>VOLTAGE |
|-------------------------------------|---|---|-------------------------------------|-----------------|-------------------|--|---|------------------|--|
|                                     |   |   | Z <sub>ZT</sub> @ I <sub>ZT</sub>   | Z <sub>ZK</sub> | @ I <sub>ZK</sub> |  | I <sub>R</sub>                            | @ V <sub>R</sub> |  |
|                                     |   |   | Volts                               | mA              | OHMS              |  | OHMS                                      | mA               |  |
| 1N3016B                             | 6.8   | 37  | 3.5                                 | 700             | 1.0               | 140  | 150                                       | 5.2              | .040   |
| 1N3017B                             | 7.5   | 34  | 4.0                                 | 700             | .5                | 125  | 100                                       | 5.7              | .045   |
| 1N3018B                             | 8.2   | 31  | 4.5                                 | 700             | .5                | 115  | 50  | 6.2              | .048   |
| 1N3019B                             | 9.1   | 28  | 5                                   | 700             | .5                | 105  | 25  | 6.9              | .050   |
| 1N3020B                             | 10  | 25  | 7                                   | 700             | .25               | 95   | 25  | 7.6              | .055   |
| 1N3021B                             | 11  | 23  | 8                                   | 700             | .25               | 85   | 10  | 8.4              | .060   |
| 1N3022B                             | 12  | 21  | 9                                   | 700             | .25               | 80   | 10  | 9.1              | .065   |
| 1N3023B                             | 13  | 19  | 10                                  | 700             | .25               | 74   | 10  | 9.9              | .065   |
| 1N3024B                             | 15  | 17  | 14                                  | 700             | .25               | 63   | 10  | 11.4             | .070   |
| 1N3025B                             | 16  | 15.5  | 16                                  | 700             | .25               | 60   | 10  | 12.2             | .070   |
| 1N3026B                             | 18  | 14  | 20                                  | 750             | .25               | 52   | 10  | 13.7             | .075   |
| 1N3027B                             | 20  | 12.5  | 22                                  | 750             | .25               | 47   | 10  | 15.2             | .075   |
| 1N3028B                             | 22  | 11.5  | 23                                  | 750             | .25               | 43   | 10  | 16.7             | .080   |
| 1N3029B                             | 24  | 10.5  | 25                                  | 750             | .25               | 40   | 10  | 18.2             | .080   |
| 1N3030B                             | 27  | 9.5   | 35                                  | 750             | .25               | 34   | 10  | 20.6             | .085   |
| 1N3031B                             | 30  | 8.5   | 40                                  | 1000            | .25               | 31   | 10  | 22.8             | .085   |
| 1N3032B                             | 33  | 7.5   | 45                                  | 1000            | .25               | 28   | 10  | 25.1             | .085   |
| 1N3033B                             | 36  | 7.0   | 50                                  | 1000            | .25               | 26   | 10  | 27.4             | .085   |
| 1N3034B                             | 39  | 6.5   | 60                                  | 1000            | .25               | 23   | 10  | 29.7             | .090   |
| 1N3035B                             | 43  | 6.0   | 70                                  | 1500            | .25               | 21   | 10  | 32.7             | .090   |
| 1N3036B                             | 47  | 5.5   | 80                                  | 1500            | .25               | 19   | 10  | 35.8             | .090   |
| 1N3037B                             | 51  | 5.0   | 95                                  | 1500            | .25               | 18   | 10  | 38.8             | .090   |
| 1N3038B                             | 56  | 4.5   | 110                                 | 2000            | .25               | 17   | 10  | 42.6             | .090   |
| 1N3039B                             | 62  | 4.0   | 125                                 | 2000            | .25               | 15   | 10  | 47.1             | .090   |
| 1N3040B                             | 68  | 3.7   | 150                                 | 2000            | .25               | 14   | 10  | 51.7             | .090   |
| 1N3041B                             | 75  | 3.3   | 175                                 | 2000            | .25               | 12   | 10  | 56.0             | .090   |
| 1N3042B                             | 82  | 3.0   | 200                                 | 3000            | .25               | 11   | 10  | 62.2             | .090   |
| 1N3043B                             | 91  | 2.8   | 250                                 | 3000            | .25               | 10   | 10  | 69.2             | .090   |
| 1N3044B                             | 100   | 2.5   | 350                                 | 3000            | .25               | 9.0  | 10  | 76.0             | .090   |
| 1N3045B                             | 110   | 2.3   | 450                                 | 4000            | .25               | 8.3  | 10  | 83.6             | .095   |
| 1N3046B                             | 120   | 2.0   | 550                                 | 4500            | .25               | 8.0  | 10  | 91.2             | .095   |
| 1N3047B                             | 130   | 1.9   | 700                                 | 5000            | .25               | 6.9  | 10  | 98.8             | .095   |
| 1N3048B                             | 150   | 1.7   | 1000                                | 6000            | .25               | 5.7  | 10  | 114.0            | .095   |
| 1N3049B                             | 160   | 1.6   | 1100                                | 6500            | .25               | 5.4  | 10  | 121.6            | .095   |
| 1N3050B                             | 180   | 1.4   | 1200                                | 7000            | .25               | 4.9  | 10  | 136.8            | .095   |
| 1N3051B                             | 200   | 1.2   | 1500                                | 8000            | .25               | 4.6  | 10  | 152.0            | .100   |

\*JEDEC Registered Data. †Not JEDEC Data.

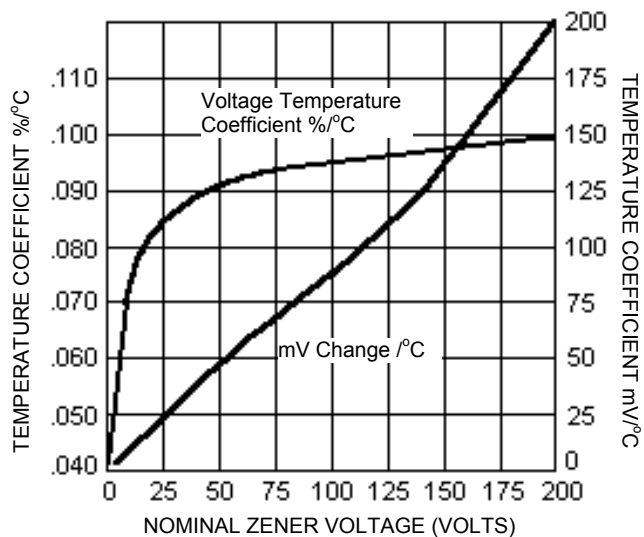
- NOTES:**
- When using JEDEC numbers, B suffix signifies +/-5% tolerance on nominal zener voltage. The suffix A is used to identify +/-10% tolerance; no suffix indicates +/-20% tolerance; suffix C is used to identify +/- 2%; and suffix D is used to identify +/- 1% tolerance.
  - Zener Voltage ( $V_Z$ ) is measured with junction in thermal equilibrium with still air at a temperature of 25°C. The test currents ( $I_{ZT}$ ) at nominal voltages provide a constant 0.25 watts.
  - The zener impedance is derived when a 60 cycle ac current having an rms value equal to 10% of the dc zener current ( $I_{ZT}$  or  $I_{ZK}$ ) is superimposed on  $I_{ZT}$  or  $I_{ZK}$ . Zener impedance is measured at 2 points to ensure a sharp knee on the breakdown curve and to eliminate unstable units. See MicroNote 202 for variation in dynamic impedance with different zener currents.
  - These values of  $I_{ZM}$  may often be exceeded in the case of individual diodes. The values shown are calculated for a unit at the high voltage end of its tolerance range. Allowance has also been made for the rise in zener voltage above  $V_{ZT}$  that results from zener impedance and the increase in junction temperature as a unit approaches thermal equilibrium at a dissipation of 1 watt. The  $I_{ZM}$  values shown for +/-5% tolerance units may be used with little error for +/-10% tolerance units, but should be reduced by 7% to include a +/-20% tolerance unit near the high voltage end of its tolerance range.

**OUTLINE AND CIRCUIT**

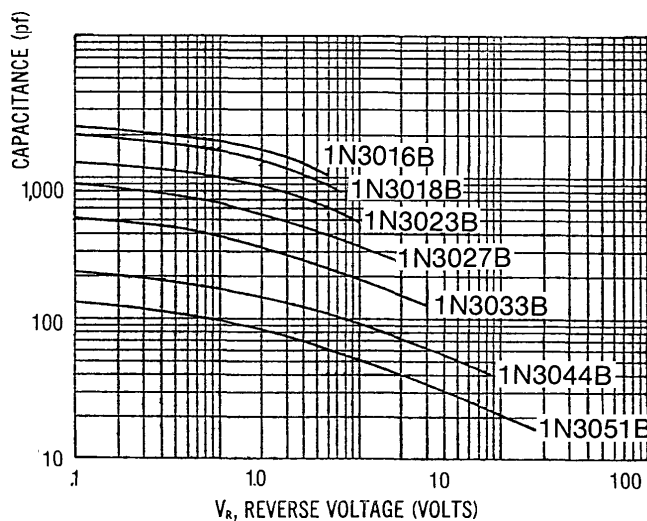


$T_L$  - Lead Temperature ( $^{\circ}\text{C}$ ) 3/8" from body  
or  $T_A$  on FR4 PC Board

**FIGURE 1**  
Power Derating Curve

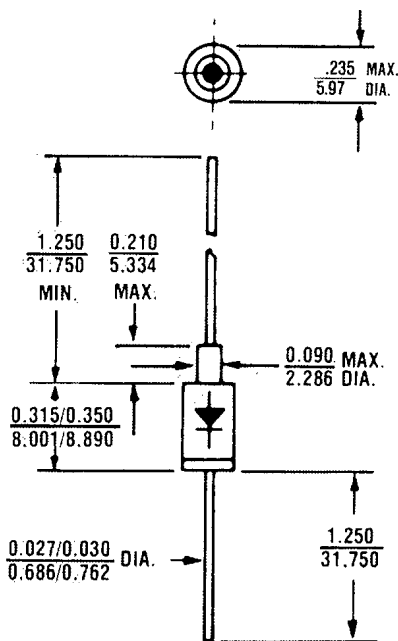


**FIGURE 2**  
Typical Zener Voltage Temperature  
Coeff. vs. Zener Voltage



**FIGURE 3**  
Typical Capacitance vs. Reverse Voltage for 1-Watt Zeners

**PACKAGE DIMENSIONS**



All dimensions in  $\frac{\text{INCH}}{\text{m.m.}}$

**DO-13 (DO-202AA)**

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